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Addressing Sleep in Pediatric Primary Care: A Review of the Literature

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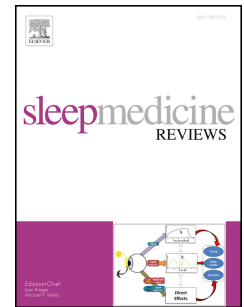
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## Summary

Primary care is a critical setting for screening and management of pediatric sleep difficulties. This review summarizes studies examining the prevalence of sleep problems in primary care settings as well as current practices in screening, diagnosis, and management, including behavioral recommendations and medications. Potential barriers to effectively addressing sleep are also reviewed. Despite the high prevalence of pediatric sleep problems in primary care, rates of screening and management are low. Primary care providers receive minimal sleep training and have resulting gaps in knowledge and confidence. Parents similarly have gaps in knowledge and many factors contribute to their identification of sleep as problematic. Recommendations to improve the provision of sleep services in pediatric primary care are made in the areas of research, practice, and education.

**Key Words:** Sleep, Pediatric, Primary Care, Screening, Diagnosis, Management, Child, Adolescent, Obstructive Sleep Apnea, Insomnia

## Introduction

A wealth of evidence supports the importance of sleep for optimal child and family functioning, and has identified the myriad of negative outcomes associated with insufficient or disrupted sleep.(1, 2) Yet sleep issues, including sleep disorders, insufficient sleep, and poor sleep habits, are widespread in youth. Prevalence rates for pediatric sleep disorders range from 1-3% for obstructive sleep apnea to as high as 20-30% for pediatric insomnia.(3) Furthermore, insufficient sleep is the norm in adolescence, with the majority of US adolescents sleeping less than recommended on school nights.(2, 4) Although there are a number of effective interventions (including prevention and education) to address sleep issues across development, for many youth sleep issues are not regularly identified or treated.

Almost all children have regularly scheduled well-child visits with a primary health care provider, usually a pediatrician or family practice physician. With regular access to families and scheduled health supervision visits, primary care represents an important setting for the screening and management of sleep issues in infants, children, and adolescents. A number of studies, however, have raised questions about the effectiveness of current practices addressing sleep in pediatric primary care(5, 6)

While collectively the sleep field has a wealth of knowledge about sleep problems and sleep disorders, there remains a relatively small number of trained pediatric sleep providers. Since 2007 the American Board of Pediatrics and the American Board of Family Medicine have certified only 251 and 138 sleep sub-specialists, respectively, compared to a population of more than 100,000 general pediatricians and more than 75,000 general family practitioners in the United States.(7, 8). Further, pediatric sleep professionals tend to reside in major urban areas (often within academic institutions), and/or require a specialty referral, limiting access for a large

portion of the general population. In order to better disseminate the knowledge and expertise of sleep professionals to pediatric primary care providers it is essential to better understand existing practices in pediatric primary care.

Thus the goal of this paper is to summarize the literature on current sleep related practices in pediatric primary care settings, with the hope that this will facilitate the development and implementation of much needed education and tools for pediatric health care providers. The first part of this review will focus on prevalence rates, current screening and identification processes, and the treatment or management of sleep issues in pediatric primary care. The second part of the review will discuss the common barriers for addressing sleep in pediatric primary care practice. Finally, we will discuss what has been learned from this review and how that should influence the next steps for clinical practice and research.

## **Methods**

Articles that focused on sleep in pediatric primary care were identified through searches in PubMed, PsychINFO, and CINAHL databases using the search terms “primary health care” and “sleep,” limiting results to children ages 0-18 years, and peer-review journal articles written in English.

The following inclusion criteria were used for all studies included in the section on current practices. First, the study described prevalence rates, guidance, screening, and management of pediatric sleep disorders or problems in primary care settings. Second, the patient population was pediatric (18 and under) or the pediatric data was presented separately from the adult data. Third, the data was collected in a primary care setting, and included a sample that was generally representative of all patients within the practice or in a certain age

group (e.g. all children under the age of 5 was included, but a special population within the practice such as only children with intellectual disabilities was excluded). Additional exclusion and inclusion criteria were applied for each topic area of interest, as seen in Table 1.

A total of 424 abstracts published between 1985 and September 2014 were identified with the initial search criteria. Most of these were excluded because they did not meet inclusion criteria, resulting in 12 papers for review. An additional 18 papers were identified through the examination of the reference lists for identified articles. This resulted in a total of 30 papers included in our review.

## **Sleep in Pediatric Primary Care**

### *Prevalence Rates of Sleep Problems in Pediatric Primary Care*

Table 2 highlights significant variability in prevalence rates of sleep problems in pediatric primary care depending on the data collection method.

#### **Sleep Problem Prevalence based on Provider Report**

In three studies of pediatricians in the United States and Italy, most providers reported fewer than 25% of their patients had sleep problems.(6, 9, 10) When providers were queried directly about the frequency of encounters with behavioral sleep problems (e.g., bedtime resistance, difficulty falling asleep), more than half reported either daily or weekly encounters (Davis et al. 2012).(11) Across five studies, encounters with significant sleep problems were most common among the youngest patients (0-4 years old).(6, 9, 10, 12, 13) Compared to other problems encountered in pediatric primary care, sleep always fell within the top half of concerns, following issues such as growth, and physical illness.(9, 10, 14, 15)

### Sleep Problem Prevalence based on Parent Report

Using measures of global sleep problems within primary care, parents in two studies identified a prevalence rate of 11-12% in children,(16, 17) a rate similar to that of community surveys conducted in other settings.<sup>e.g.,</sup> (3)(18) When queried about specific sleep concerns, prevalence rates reported included 11-17% for snoring or sleep disordered breathing, 0.4-29% for various parasomnias, 16% for daytime sleepiness, and up to 41% for symptoms of insomnia.(16, 17, 19) Notably one study found that more than 20% of parents reported a specific sleep abnormality occurring at least weekly.(17)

### Documentation of Sleep Problem Prevalence

Not surprisingly, the documentation of sleep disorders is even lower than both reports of “sleep problems” and estimates of community prevalence rates when examined by medical record review. In a review of diagnostic codes generated for a large primary care network, only 3.7% of children received an ICD-9 sleep diagnosis(20), with diagnostic rates for insomnia (0.05%) particularly low. Another study that used a parent-reported screening questionnaire to identify sleep problems found that only two children (out of 86) with a parent reported sleep problem had a sleep disorder diagnosis documented that day, and only 10% of children with a parent reported sleep problem had a diagnosis documented in any of the chart notes over the previous two years.(16)

### Summary of Sleep Problem Prevalence Rates in Pediatric Primary Care

Overall, primary care providers (PCPs) report their perception that sleep difficulties occur in approximately 20% of young children (6 months – 4 years). However, diagnosed sleep disorders in general, as well as sleep problems in older children and adolescents were less

commonly recognized. Further, prevalence rates of sleep problems reported by PCPs reports are lower than those reported by parents.

It is notable that for both parent and PCP-report, the highest frequencies of problems were identified in infants and toddlers, with behaviorally-based sleep disorders (e.g. pediatric insomnia) seen more often than physiologically-based sleep disorders (e.g. obstructive sleep apnea, sleep terrors) across all age groups. As we will review later, however, the use of interventions to address these behavioral sleep concerns remains limited in primary care.

#### *Practices Related to Screening and Documentation of Sleep in Pediatric Primary Care*

Table 3 summarizes studies that have examined practices pertaining to the screening and documentation of sleep problems in pediatric primary care.

##### *PCP Report of Screening Practices*

Two studies asked primary care pediatricians about their practices screening for sleep problems.(6, 21) While both studies found that providers reported regularly screening for sleep problems across age groups, it was also notable that the majority of respondents used only a single question to inquire about sleep concerns. Screening questions used most often varied by the child's age, and frequency of screening for snoring was not common (only 27% of school-aged children).(6) In addition, providers focused on parental report of sleep, with only about a third of providers asking school-aged children and adolescents directly about their sleep.(6)

##### *Parental Report of Provider Screening Practices*

Only one survey examined parental reports of provider screening practices(22), with 52% of parents of children 10 and younger reported that their child's physician did not regularly ask



about their child's sleep habits.(22) This suggests a parental perception that primary care providers screen for sleep problems less frequently than providers report.

#### Documentation of Sleep Screening

As a proxy of screening, two medical record review studies have examined the frequency of documentation of sleep issues in pediatric primary care.(16, 23) In a study of well-child visits to an urban clinic, documentation of screening for snoring was found for only 24% of children.(23) However, for those who did snore, most (75%) were further asked about witnessed apneas. Another study of two general pediatric clinics examined chart notes for a sample of youth in which parents had identified problematic sleep symptoms via questionnaire on the day of the clinic visit. Fewer than 10% of chart notes from that visit documented symptoms of sleep disorders including periodic limb movements, sleep-disordered breathing, or excessive sleepiness, and fewer than 15% documented symptoms of insomnia.(16) One limitation of this study is that although sleep problems were identified by questionnaire prior to the visit, it is not clear if the provider or the parent raised these issues during the actual visit.

One study was identified that examined an intervention to increase the screening for and documentation of sleep problems in primary care. Owens & Dalzell (2005)(24) compared rates of screening for various sleep domains before and after starting the practice of placing a blank sleep screening tool ("BEARS") in the medical charts of children seen by pediatric residents. This screening tool is open-ended in nature and includes suggested trigger questions to prompt discussion in five major sleep domains: Bedtime problems, Excessive daytime sleepiness, Awakenings during the night, Regularity and duration of sleep, and Sleep-disordered breathing. The use of the tool increased screening practices in all seven sleep domains measured, in some cases more than ten-fold (e.g. screening for snoring in 93% versus 7% of children). Increases in

screening practices resulted in higher rates of identification for bedtime problems, night wakings and snoring, and also resulted in an increase in the inclusion of sleep in the overall impression or treatment plan. What is not clear, however, is the extent to which the use of this tool increased visit length, a factor that would likely influence its acceptability to providers.

## Summary

Pediatricians generally report regular screening for sleep disorders, particularly in younger children. One common practice appears to be asking a single question about sleep patterns or parental concerns. Screening is quite variable by sleep domain, with the highest rates for sleep patterns, moderate rates for snoring, and the lowest rates for symptoms such as periodic leg movements. However, parental reports and documentation of sleep issues suggest much lower rates of screening.

## *Treatment of Sleep Issues in Primary Care*

Table 4 includes studies of that have examined the treatment of pediatric sleep issues in primary care.

## PCP Report of Sleep Management Strategies

Only two studies were identified that asked pediatricians about their use of sleep management strategies, both focusing on children ages 6 months to 4 years.(9, 10) In these studies, a bedtime routine was the most commonly recommended intervention (83-95%), while “no intervention” was not regularly recommended (3-7%). Cultural differences were notable across these studies, with pharmacological interventions more likely to be recommended in Italy vs. the United States (59% vs. 15%), and a graduated extinction approach more likely to be recommended in the US vs. Italy (85% vs. 36%). Notably no studies were found that asked

pediatricians about their use of interventions to address sleep in middle childhood or adolescence.

Asking providers how they might respond to hypothetical clinical scenarios, Owens et al. (2001)(6) found that graduated extinction was the most commonly endorsed intervention for infant night wakings. For a preschooler with bedtime fears, most pediatricians selected the use of a transitional object and positive reinforcement as the most likely interventions. Parental reassurance and a regular sleep schedule were endorsed most often for a school-aged child with regular sleep terrors. Pediatricians also identified a consistent sleep schedule and stimulus control procedures as treatments they would use for a child with insomnia symptoms. Finally, across ages, the most frequent recommendation identified for a patient with suspected OSA was a referral for adenotonsillectomy if tonsils were enlarged and nasal steroids if the adenoids were enlarged. Although providers may not actually implement these strategies, it is encouraging that they were able to identify empirically supported treatments for the most common pediatric sleep issues.

In terms of pharmacological interventions for sleep issues, two studies reported on common practices of pediatric PCPs. One study found that although behavioral intervention as a stand-alone treatment was used by almost all providers sampled (93%), Fifty-five percent of providers reported sometimes using behavioral treatments in combination with medications and 40% reported sometimes using medications as a stand-alone treatment. (25) Another study of pediatric practitioners found the most common reasons to use prescription and over-the-counter (OTC) medications were insomnia and bedtime problems/sleep onset delay, with less frequent use for delayed sleep phase, night wakings, sleep walking or sleep terrors, and RLS/PLMD.(13) Across both studies the most commonly prescribed medication-type was alpha-2 agonists (e.g.,

clonidine, 31-46%), while antihistamines were the most commonly recommended OTC medication (68-83%). Other commonly recommended/prescribed pharmacological interventions included melatonin (25-42%), tricyclic antidepressants (31%), other antidepressants (30%), and other OTC and herbal remedies (22-29%).

#### Documentation of Sleep Management Strategies

Documentation in the medical record of recommendations for sleep intervention is consistently low across studies and sleep issues. In a large sample of primary care visits, documented recommendations for sleep were identified for only 8% of children with a diagnosed sleep disorder and only 2% of children with an identified sleep problem (e.g., bedtime resistance).(5) Thus while a sleep diagnosis slightly increased the likelihood of a documented sleep recommendation, most children with identified sleep disorders and sleep problems did not have any documented sleep treatment. Of the recommendations documented, behavioral interventions were most common, followed by referral, monitoring, and general discussion. Similarly, in another study of patients who screened positively for snoring, only 38% had a documented referral or treatment.(23) Finally, when sleep problems were identified prior to the clinic visit via questionnaire, it was notable that no patients had a documented sleep recommendation on that day, with only four patients (4%) having documented sleep treatments over the past two years.(16)

In terms of pharmacological management of sleep problems in children, only one published study was identified, with 6% of patients prescribed potentially sleep-related medications.(20) However, because many medications used to address sleep in pediatrics also have other indications (e.g. antihistamines, antipsychotic agents) and most children in the sample

did not have documented sleep disorders, the number of medications that were prescribed specifically for a sleep disturbance remains unclear.

#### Intervention Studies Conducted within Primary Care

Despite more than sixty studies demonstrating the efficacy of sleep intervention or prevention approaches,(26-29) only two studies were identified that evaluated the effectiveness of interventions when delivered in a pediatric primary care setting. Adair and colleagues (1993)(30) evaluated a brief intervention designed to prevent problematic infant night wakings delivered by pediatricians in primary care during the 4-month and 6-month well-child visits. Infants receiving this intervention had significantly fewer night wakings at nine months compared to control infants. Also examining a preventive intervention in infants, Adachi et al. (2009)(31) gave a ten-minute educational group session and educational booklet to mothers of infants during a 4-month well-child visit. A 3-month follow-up survey showed higher rates of recommended parenting behaviors and fewer night wakings in infants in the intervention group, compared to both baseline and control groups. Thus, brief preventive information delivered in primary care settings to mothers of young infants appears to reduce the frequency of problematic infant night wakings.

#### Summary

Despite provider recognition of appropriate interventions for sleep issues across development, it was notable in this review that most patients with identified sleep issues did not receive a treatment recommendation or referral. Though many pediatricians report recommending specific sleep intervention strategies, and could identify many empirically supported treatments, documentation of these interventions suggests very few patients are

actually receiving these interventions. It is important to acknowledge that clinical documentation may not reflect actual clinical practices, as providers may have provided an intervention but failed to document at all, or in a manner identified by chart review procedures. Studies employing methodology such as patient exit interviews or examination of actual session content (e.g., videotaped sessions) would offer more clarity in regards to actual practice patterns. Finally, additional research is needed to evaluate the effectiveness of interventions delivered within the primary care setting to children of all ages, including behavioral interventions that address the myriad of pediatric sleep issues beyond simple prevention strategies for mothers of young infants.

#### *Barriers to the Identification and Treatment of Sleep Issues in Pediatric Primary Care*

Table 5 lists studies that have examined both provider and patient barriers to the identification and treatment of sleep issues in pediatric primary care.

##### *PCP Perception of Barriers*

Two studies examined provider perceptions of barriers to sleep screening in primary care.(6, 21) The four barriers to sleep screening most frequently endorsed by pediatricians across the two studies were 1) the belief that parents would raise sleep concerns without screening if there was a problem (12-22%), 2) sleep screening takes away time from other concerns (9-10%), 3) respondents did not feel knowledgeable about sleep (9%) and 4) sleep screening takes too much time in general (6-8%). Of note, no single barrier was identified by more than one quarter of the sample in either study, indicating lack of consensus about barriers to sleep screening.

Although our review focuses on studies examining the lack of training and knowledge about sleep in pediatric PCP (described below), clearly time constraints have a major impact on

the practice of primary care providers. For example, in one study providers who reported regularly screening for sleep problems spent significantly more time with each patient (M=18.2 minutes) compared to providers who did not screen for sleep (M=12.6 minutes).(21) This structural barrier is clearly relevant, however we did not find any other studies that examined the role of time or visit length associated with sleep practices.

#### Insufficient Education and Training in Pediatric Sleep

While the lack of training in sleep is an issue for all medical students, the average amount of time spent on pediatric sleep is even more negligible. One study found that medical schools in the United States spend a total of 187 minutes educating students about sleep, with only 27 minutes focused on pediatrics.(32) A more recent survey of more than four hundred medical schools in twelve countries found the average amount of time spent on sleep was just 146 minutes, with an average of only 17 minutes of this time devoted to pediatrics.(33) Fewer than half (44%) of these programs reported covering pediatric sleep disorders at all.

Although minimal, additional education about sleep is seen during pediatric residency programs, with reports of an average of 4.4 hours internationally and between 2.7 and 4.8 hours in the United States.(10, 34) However, 23% of international programs and 46% of US programs (in 1994) reported no coverage of pediatric sleep. It is important to consider that the response rate was low for these studies suggesting a potential overestimate of training in sleep.

When general pediatricians and pediatric nurse practitioners have been asked about their formal training experiences in pediatric sleep, only 18% of pediatricians and 29% of pediatric nurse practitioners reported receiving this training.(12, 21) Also notable is that only 24% of

pediatricians and 17% of pediatric nurse practitioners reported continuing education on pediatric sleep since completing their training, with much of this coming from journal articles.

Overall, sleep training and education for pediatric primary care providers is quite limited. Coverage in undergraduate medical education is both limited and adult-focused. Pediatric residency programs devote slightly more time to sleep education, though still less than would be expected given the prevalence rates of sleep disorders and sleep problems. Lack of training and education in sleep, particularly pediatric sleep, represents a clear barrier to effective management of sleep in primary care, resulting in limited provider knowledge about pediatric sleep, which in turn creates a lack of provider comfort/confidence in identifying and addressing sleep issues.

#### Provider Knowledge about Pediatric Sleep

Across four studies in both the United States and Italy, it is clear that insufficient general knowledge about pediatric sleep is a significant barrier within pediatric primary care. Using different tests with true/false items about sleep knowledge, these studies found that pediatricians scored between 42 and 72% correct overall.(6, 9, 10, 21) When separate scores were provided for specific domains, knowledge was greatest for developmental issues and sleep hygiene, with lowest scores for sleep disorders including narcolepsy, excessive daytime sleepiness, and RLS/PLMD. Two studies specifically examined provider knowledge of pediatric OSA in the United States and Turkey, with a mean score of 69% in both studies for family physicians and pediatricians.(35, 36) Items pertaining to complications and clinical symptoms were answered correctly more often, with lower performance for items regarding prevalence and at-risk populations.



Low sleep knowledge scores are not surprising in the context of infrequent pediatric sleep didactic lectures and training opportunities in medical education and residency. However, this knowledge deficit may impact clinical care when providers do not feel comfortable or confident in their ability to address sleep issues in pediatric primary care.

#### Provider Comfort and Confidence Related to Pediatric Sleep

Seven studies were identified in which primary care physicians were asked to rate their perceived comfort or confidence addressing sleep. The way comfort level was assessed varied greatly across studies, however in general these articles show pediatric primary care providers have, at best, a low to moderate level of comfort in the evaluation and treatment of pediatric sleep issues.

In one study of US primary care pediatricians, although the mean comfort level for sleep problems was moderate, the score was much lower than other areas of developmental/behavioral pediatrics (17<sup>th</sup> out of 26 areas in developmental/behavioral pediatrics).(14) However, when queried specifically about behavioral sleep problems, another study found much greater confidence in the diagnosis and treatment of behavioral sleep disturbance.(11)

In another sample of US PCPs, fewer than half of respondents endorsed feeling confident or very confident in screening (46%), evaluating (34%) or treating (25%) sleep disorders.(6) In a sample of pediatric nurse practitioners, mean confidence ratings for evaluating and treating specific sleep disorders were highest for behavioral issues such as night wakings and lowest for sleep disorders including narcolepsy.(12)

In studies specifically examining pediatric OSA, confidence in the ability to identify children with OSA was moderate, but somewhat lower when it came to the management of

children with OSA, in particular those receiving CPAP therapy.(35, 36) Notably in a Turkish sample, pediatricians reported greater confidence than pulmonologists and general practitioners.(35)

Finally, Faruqui and colleagues (2011)(21) found significantly lower confidence scores in pediatricians who reported not regularly screening for sleep disorders. Highlighting the importance of training, they further found that PCPs with formal training in sleep had significantly higher knowledge and confidence scores, and endorsed fewer barriers to screening.

In sum, comfort and confidence addressing sleep was low to moderate across studies, with considerable variability by sleep disorder and type of service rendered. It should also be noted that there were significant methodological differences in these studies, including how the questions were asked, as well as what other types of pediatric issues sleep were compared to. However, a greater comfort level with behavioral sleep problems was identified across studies compared to other medical sleep disorders (e.g., narcolepsy or OSA) .

#### Caregiver Reporting of Sleep Problems

One perceived barrier to sleep screening in pediatric primary care is provider perception that a parent will raise concerns about problematic sleep as needed.(6) However, this may not always be the case. Three studies have examined rates of parental help-seeking from PCPs in the context of child sleep concerns. In a US sample of parents of school-aged children recruited from primary care, only 16% of parents who identified a sleep problem in their child in the past six months reported discussing it with the pediatrician.(17) Similarly, only 14% of Australian parents with children who had a score in the clinical range on a validated sleep measure had discussed sleep with the pediatrician in the past year.(37) Parents were more likely to discuss

problems pertaining to sleep-disordered breathing and excessive daytime sleepiness than other areas, such as insomnia. In another Australian sample, only 8% of parents who endorsed frequent snoring on a questionnaire reported they had discussed snoring with their child's pediatrician that day, and only 15% in the past year.(38)

While none of these studies assessed parental perceptions of barriers to discussing sleep problems with PCPs, one reason parents may not raise concerns about sleep with PCPs is insufficient parental knowledge about sleep and sleep issues. Two studies have examined parental knowledge of pediatric sleep issues within a primary care context. In a sample of low-income mothers surveyed in a pediatrician's office about multiple areas of infant development, mothers knew the least about infant sleep, with only 26% of sleep related items answered correctly.(39) Another study examined general sleep knowledge in parents of children ages 3 months to 12 years attending a pediatric primary care clinic found a mean score of 4.4 correct in a measure of 10 true/false items.(40) Notably, 76% of parents underestimated the recommended sleep range for their child's age group.

In sum, parental knowledge about pediatric sleep is limited, with scores on knowledge questionnaires similar to what would be expected by chance alone. Knowledge was generally better for infant sleep and/or normal sleep patterns, with more limited knowledge of sleep in older children and/or problematic sleep. Thus the expectation that parents will raise sleep issues within the context of pediatric primary care may be unrealistic, as parents may not always recognize when their child's sleep is problematic.

## **Discussion**

In this review we examined sleep in pediatric primary care. Although the literature in this area remains small, a number of key issues were identified related to the screening and treatment of sleep problems across development. Most notable is that sleep is commonly not addressed within pediatric primary care, with low rates of prevention, identification, and intervention. By the age of 18 children will have spent 40% of their lives sleeping, with poor or insufficient sleep taking a significant toll on learning, growth, and development. Yet very little time (if any) is spent on pediatric primary care provider education about sleep, resulting in the deficits within primary care practice. Along with diet and exercise, sleep is a key pillar of health. As other programs have raised the bar on the importance of recognizing and addressing physical health, oral health, and behavioral health in pediatrics, so too should sleep professionals sound the alarm about the importance of sleep health for youth of all ages.

In terms of barriers to overcome, lack of provider education is arguably the greatest challenge. Without proper training and experience with sleep issues, providers may avoid asking questions about a child's sleep due to a lack of comfort in how to respond if a sleep issue is endorsed. In addition, sleep is not a simple behavior. Everyone sleeps at some point (preventing a simple yes/no screening question like does your child wear a seat belt), but the night-to-night variability of sleep, and the number of ways in which sleep can go wrong are complex, dynamic, and often require more time than is allowed during a regular well-child visit. Sleep professionals have a role in improving provider education by offering not only didactic lectures, but also clinical training experiences to current providers and those in training. With continuing advances in technology, web-based training modules or brief learning moments disseminated through smart-phone apps may help address some of the knowledge deficits in practicing providers.

Primary care providers would benefit from additional guidelines on the screening and treatment of sleep issues.(41, 42) Although the American Academy of Pediatrics updated their guidelines on the diagnosis and treatment of obstructive sleep apnea in 2012,(43), similar guidelines are needed for addressing deficient sleep and other sleep issues commonly seen in pediatrics. One solution may be the use of computerized decision support systems that help PCPs prioritize guidelines and use evidence-based screening and intervention tools. For example, while not specifically designed to increase screening practices for sleep, one study found providers were more likely to document screening for sleep problems when using an electronic medical record with prompts, compared to a paper-based record.(44) With electronic medical records use becoming universal, there is a need to continue developing tools for pediatric sleep and incorporating them into support systems to more effectively address sleep in primary care.

That said, the reliance on a single global question about problematic sleep may result in continued under-identification of many problematic sleep issues.(45) However, a simple intervention to increase sleep screening practices using the BEARS tool was shown to be highly impactful.(24) Further study of this and similar approaches is warranted. In particular there is a need for a brief, validated screening tool be developed that can be easily administered, scored, and interpreted in a busy primary care clinic.

While providers often rely on parental report to identify a sleep issue, it is clear that parents may not always be aware of what is normal or problematic sleep. As such, PCPs cannot assume that parents will accurately identify problematic sleep and raise these concerns in an office visit. Despite increased media attention to the importance of sleep, clear gaps in parental

knowledge of sleep persist. Strategies are needed to increase public knowledge and awareness about sleep.

Further, while parents play an important role in recognizing and addressing sleep problems in their children, as well as influencing the topics of discussion in health supervision visits, there are a number of factors that contribute to parental identification of problematic sleep and decision-making around whether or not to seek guidance from the PCP. For example, caregivers are less likely to raise behavioral than medical concerns,(46) suggesting that parents may be particularly reluctant to raise behavioral sleep concerns such as bedtime resistance or nighttime anxiety. There is also evidence to suggest that mothers in the US from certain ethnically diverse backgrounds (e.g. African-American, Puerto Rican) are reluctant to consult with a physician on matters relating to childrearing.(47) Specifically related to sleep, cultural differences often play a role in whether a parent identifies a certain sleep behavior as “problematic.”(48, 49) However, even in cases when parents do identify their child’s sleep as problematic and raise this concern with a PCP, they may not receive helpful guidance in managing the sleep problem.

When asked about sleep management strategies, PCPs generally endorse evidence-based strategies, such as graduated extinction and stimulus control principles. However, the evidence suggests that many children with an identified sleep problem do not receive a recommendation, treatment, or referral from PCPs. Furthermore, little is known about the efficaciousness of recommendations and treatments that are delivered to patients. Only two published sleep treatment studies were delivered in primary care, both of which were preventive and targeted infants. Many other existing treatments and intervention programs are well-suited for primary care but infrequently delivered, highlighting the need to package and disseminate sleep

treatments that can be used by PCPs. For example, studies have demonstrated improvements in the sleep of infants and young children using an internet delivery format,(50) a single visit with brief follow-up phone calls,(51) or an intervention administered by a pediatrician in one consultation supplemented by written information.(52) There is a clear need for additional studies on primary care friendly sleep interventions, not only for infants and young children, but also for older children and adolescents.

### **Concluding Remarks**

Taken together, these findings raise serious concerns about current practices addressing pediatric sleep in primary care settings. It is important to note that sleep is only one of many areas that are not sufficiently addressed in primary care. Pediatricians are faced with an overwhelming array of guidelines to try and address in a short office visit. Without guidance on how to prioritize services, PCPs tend to decide based upon their training, experience, and comfort. As we have covered in this review, PCP training and resulting comfort in pediatric sleep are problematic. Pediatric sleep clinicians and researchers have an important role to play in supporting PCPs. Education, collaboration, and the development and dissemination of primary-care friendly tools are all needed to help PCPs more effectively prevent, identify, and manage pediatric sleep problems.

Abbreviations: CPAP: Continuous Positive Airway Pressure; ICD-9: International Classification of Diseases, 9<sup>th</sup> Edition; OSA: obstructive sleep apnea; PC: primary care; PCP: primary care provider; PLMD: periodic limb movement disorder; RLS: restless legs syndrome; US: United States

**Practice Points:**

1. Pediatric primary care providers should inquire about the quantity and quality of a child's sleep at every well-child visit.
2. Parents may not raise problematic sleep symptoms or patterns with primary care providers due to lack of knowledge about sleep or cultural beliefs about what is appropriate to discuss with pediatricians.
3. Sleep professionals should play a role in offering needed sleep education to providers and the general public.

**Research Agenda:**

1. Develop and validate effective sleep screening questions and tools for primary care.
2. Examine the efficaciousness of sleep interventions delivered as part of routine care in primary care settings.
3. Develop and disseminate tools to aid PCPs in managing pediatric sleep disturbance.



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Table 1. Additional inclusion and exclusion criteria for studies included in the review.

<p><u>If health care providers subject of interest:</u></p> <ul style="list-style-type: none"> <li>-The study included practice within pediatric primary care</li> <li>-Family medicine providers included if responding about only pediatric patients</li> <li>-Studies with multiple provider types (e.g., pediatricians and neurologist) included only if PCP information identifiable separately or more than 75% of sample</li> </ul>
<p><u>For provider training experiences:</u></p> <ul style="list-style-type: none"> <li>-Both individual provider and training program surveys included</li> <li>-Subspecialty training (e.g., child psychiatry) excluded</li> </ul>
<p><u>For sleep prevention and intervention studies:</u></p> <ul style="list-style-type: none"> <li>-Intervention delivery occurred within a primary care setting</li> <li>-Interventions delivered by phone or internet excluded if not initiated in primary care setting</li> </ul>
<p><u>For parental knowledge studies:</u></p> <ul style="list-style-type: none"> <li>-Data were collected within a primary care setting</li> </ul>

Abbreviations: PCP=primary care provider

Table 2. Studies examining relevance, prevalence, and rates of encounter of sleep issues in pediatric primary care.

Study	Topic Area(s)	Notable Finding(s)
Archbold et al. 2002(19)	Prevalence (parent report)	<ul style="list-style-type: none"> <li>• Prevalence rates of 17.1% for habitual snoring, 15-29% for parasomnias, 14% for EDS</li> <li>• 41.4% of the sample had at least one insomnia symptom; 18.4% had two or more symptoms</li> </ul>
Boreman et al. 2007(14)	Relevance (PCP report)	<ul style="list-style-type: none"> <li>• PCPs rated sleep as the 11<sup>th</sup> (out of 28) most relevant area in developmental/behavioral pediatrics</li> </ul>
Bruni et al. 2004(9)	Prevalence (PCP report) Relevance (PCP report)	<ul style="list-style-type: none"> <li>• 18.6% of young children (6 months to 4 years) had sleep problems</li> <li>• Sleep 4<sup>th</sup> (of 9) most frequent parent concern</li> </ul>
Charles et al. 2011(53)	Rate of encounter (record review)	<ul style="list-style-type: none"> <li>• Sleep disturbance documented by PCPs for 3.9/1000 encounters</li> <li>• In children ages 0-4 sleep was the most frequently documented behavioral disorder</li> </ul>
Cheng et al. 1999(15)	Relevance (PCP report)	<ul style="list-style-type: none"> <li>• PCPs rated sleep as the 5<sup>th</sup> (of 11) most important health supervision topics</li> </ul>
Chervin et al. 2001(16)	Prevalence (parent report)	<ul style="list-style-type: none"> <li>• 12% of sample had symptoms suggestive of a sleep disorder on a validated sleep measure</li> </ul>
Davis et al. 2012(11)	Rate of encounter (PCP report)	<ul style="list-style-type: none"> <li>• Many providers reported daily (25.7%) or weekly (27.1%) encounters with behavioral sleep problems</li> </ul>
Meltzer et al. 2010(20)	Prevalence (record review)	<ul style="list-style-type: none"> <li>• Only 3.7% of youth received an ICD-9 sleep diagnosis</li> <li>• Diagnostic rate for insomnia was 0.05%</li> </ul>
Mindell et al. 1994(10)	Prevalence (PCP report) Relevance (PCP report)	<ul style="list-style-type: none"> <li>• 22.9% of young children (6 months to 4 years) had sleep problems</li> <li>• Sleep 5<sup>th</sup> (of 9) most frequent parental concern</li> </ul>
Mindell & Owens 2003(12)	Rate of encounter (PCP report)	<ul style="list-style-type: none"> <li>• Pediatric nurse practitioners reported a mean of 36.9 patients with sleep problems in a 3 month period</li> </ul>
Owens 2001(6)	Prevalence (PCP report)	<ul style="list-style-type: none"> <li>• 75.4% estimated &lt;25% of their patients had sleep problems</li> <li>• Percentage of PCPs reporting 25-50% prevalence rate in patients by age ranged from 41% for infants to 8.9% for school aged-children</li> </ul>
Owens et al. 2003(13)	Rate of encounter (PCP report)	<ul style="list-style-type: none"> <li>• Pediatricians reported seeing a mean of 89 patients with significant sleep problems in a typical 6-month period</li> <li>• Highest rate of patient encounters was in the 0-2 age group (mean=51)</li> </ul>
Stein et al. 2001(17)	Prevalence (parent report)	<ul style="list-style-type: none"> <li>• 10.8% of parents responded yes to a global question about whether their child has a sleep problem</li> <li>• More than 1/5 of parents reported a specific sleep abnormality at least weekly</li> </ul>

Abbreviations: EDS=Excessive daytime sleepiness; ICD-9= International Classification of Diseases, 9<sup>th</sup> Edition; PCP=primary care provider

Table 3. Studies examining the anticipatory guidance, screening, and documentation of sleep issues in pediatric primary care.

Study	Topic Area(s)	Notable Finding(s)
Chervin et al. 2001(16)	Documentation of sleep issues	<ul style="list-style-type: none"> <li>Documentation of problematic sleep symptoms found for fewer than 15% of youth with sleep problems identified by parent-completed questionnaire</li> </ul>
Erichsen et al. 2012(23)	Documentation of sleep issues	<ul style="list-style-type: none"> <li>Documentation of screening for snoring found for only 24.4% of children</li> <li>Follow-up question about witnessed apneas documented for 75% of documented snorers</li> </ul>
Faruqui et al. 2011(21)	Screening (PCP report)	<ul style="list-style-type: none"> <li>10-12% of PCPs do not screen for sleep problems in children and adolescents</li> <li>70% typically ask one question about routine sleep problems in children and adolescents</li> <li>Most common questions about usual sleep patterns, bedwetting, and snoring; least common questions about leg movement and bruxism</li> </ul>
National Sleep Foundation <i>Sleep in America</i> Poll 2004 <sup>20</sup>	Screening (Parent report)	<ul style="list-style-type: none"> <li>52% of parents reported PCP did not regularly ask about child's sleep habits</li> </ul>
Owens 2001(6)	Screening (PCP report)	<ul style="list-style-type: none"> <li>PCPs reported asking several sleep screening questions &gt;75% of visits.</li> <li>15-30% did not regularly screen for sleep concerns</li> <li>25-45% used a single question to screen for sleep concerns</li> <li>Fewer than half of PCPs ask youth directly about sleep</li> <li>Minority of PCPs reported screened for snoring (ranging 7.6% for infants to 24% for toddlers)</li> </ul>
Owens & Dalzell 2005(24)	Screening intervention	<ul style="list-style-type: none"> <li>Included BEARS tool in medical charts</li> <li>Notable increases in screening for sleep issues found, in particular snoring (increased to 93.3% from 7.2%)</li> </ul>

Abbreviations: PCP=primary care provider

Table 4. Studies examining intervention programs and practices treating sleep issues in pediatric primary care.

Study	Topic Area(s)	Notable Finding(s)
Adachi et al. 2009(31)	Intervention program	<ul style="list-style-type: none"> <li>• A brief intervention during the 4-month well-child visit resulted in reduced night wakings at 9 months</li> </ul>
Adair et al. 1992(30)	Intervention program	<ul style="list-style-type: none"> <li>• A ten minute group educational session and accompanying booklet at the 4-month well-child visit reduced night wakings at 9 months</li> </ul>
Bruni et al. 2004(9)	Treatment (PCP report)	<ul style="list-style-type: none"> <li>• Specific strategies recommended ranged from 83.4% for bedtime routine to 35.6% for graduated extinction</li> <li>• Behavioral intervention recommended by more PCPs than pharmacological intervention (83.7% vs. 58.5%)</li> </ul>
Chervin et al. 2001(16)	Treatment (chart review)	<ul style="list-style-type: none"> <li>• No children with problematic sleep (identified via parent questionnaire) had a documented sleep recommendation that day</li> <li>• 4% of children with problematic sleep had a documented sleep recommendation in the past two years</li> </ul>
Erichsen et al. 2012(23)	Treatment (chart review)	<ul style="list-style-type: none"> <li>• 39.4% of snoring children had a documented referral or treatment</li> <li>• Referral to ENT was the most frequent management strategy</li> </ul>
Meltzer et al. 2014(5)	Treatment (chart review)	<ul style="list-style-type: none"> <li>• Recommendations documented for 8% of children with a diagnosed sleep disorder and 2% of children with an identified sleep problem</li> <li>• 6% of children prescribed potentially sleep-related medications</li> </ul>
Mindell et al. 1994(10)	Treatment (PCP report)	<ul style="list-style-type: none"> <li>• Specific strategies range from 95.1% for bedtime routine to 17.6% for bedtime fading</li> <li>• 65.7% of pediatricians believe they are usually or always successful treating sleep problems</li> </ul>
Owens 2001(6)	Treatment (PCP report)	<ul style="list-style-type: none"> <li>• Providers asked how they might respond to hypothetical clinical scenarios generally endorsed evidence-based management strategies</li> </ul>
Owens et al. 2003(13)	Treatment (PCP report)	<ul style="list-style-type: none"> <li>• PCP use of medication for sleep most common for insomnia symptoms (reported by 38-39% of PCPs)</li> <li>• Medications used by the most PCPs were antihistamines (67.9%), and alpha-agonists (30.6%).</li> </ul>
Schnoes et al. 2006(25)	Treatment (PCP report)	<ul style="list-style-type: none"> <li>• 92% of PCPs reported they sometimes use behavioral intervention alone, 39.6% medication alone, and 55% both in combination</li> <li>• Antihistamines used most commonly (83% of PCPs) followed by alpha-2-adrenergic agonists (45.5%) and melatonin (42%)</li> </ul>

Abbreviations: ENT=ear, nose, and throat specialist; PCP=primary care provider



Table 5. Studies examining the barriers for identification and treatment of sleep issues in pediatric primary care.

Study	Topic Area(s)	Notable Finding(s)
Blunden et al. 2003(38)	Parental help-seeking	<ul style="list-style-type: none"> <li>• 15% of parents whose children snored reported they had discussed this with their child's PCP in the past year</li> </ul>
Blunden et al. 2004(37)	Parental help-seeking	<ul style="list-style-type: none"> <li>• Of children with problematic sleep per a validated measure, 4.1% of parents raised sleep with PCP that day and 14% had raised sleep in the past year</li> <li>• Parents of children with SBD or EDS were more likely to discuss with PCP</li> </ul>
Boreman et al. 2007(14)	PCP comfort	<ul style="list-style-type: none"> <li>• Mean rating for comfort addressing sleep was 2.2 (1=comfortable; 4=not at all comfortable)</li> <li>• Sleep ranked 17<sup>th</sup> lowest in comfort out of 26 areas in developmental/behavioral pediatrics</li> </ul>
Bruni et al. 2004(9)	PCP knowledge	<ul style="list-style-type: none"> <li>• Pediatricians had a mean score of 55.57% correct on a sleep knowledge test</li> </ul>
Cheng et al. 1999(15)	PCP comfort	<ul style="list-style-type: none"> <li>• 93% report high confidence in counseling prevention for sleep; 67% feel they have the ability to prevent sleep problems</li> </ul>
Davis et al. 2012(11)	PCP comfort	<ul style="list-style-type: none"> <li>• For behavioral sleep problems, 76.9% comfortable with assessment and 58.5% with treatment</li> </ul>
Faruqui et al. 2011(21)	PCP perception of barriers PCP education & training PCP knowledge PCP comfort	<ul style="list-style-type: none"> <li>• Most frequently endorsed reason for not screening was that parents would indicate a problem without questioning (12% of PCPs)</li> <li>• 18% of US pediatricians reported formal training in sleep &amp; 24% reported post-training CE in pediatric sleep</li> <li>• Mean score on a sleep knowledge test was 41.5% correct</li> <li>• Confidence in screening, advising, motivating, managing, and conducting follow-up for sleep problems was variable, with most PCPs reporting moderate comfort levels</li> </ul>
Mindell et al. 2013(34)	PCP education & training	<ul style="list-style-type: none"> <li>• Mean pediatric sleep coverage in pediatric residency programs was 4.4 hours.</li> <li>• 23% of programs did not cover pediatric sleep at all</li> </ul>
Mindell et al. 1994(10)	PCP education & training PCP knowledge	<ul style="list-style-type: none"> <li>• Mean sleep education for pediatric residency programs was 4.8 hours</li> <li>• Pediatricians scored on average 71.8% correct on a sleep knowledge test</li> </ul>
Mindell et al. 2011(33)	PCP education & training	<ul style="list-style-type: none"> <li>• Mean sleep coverage in medical schools was 146 minutes (US mean &lt;3 hours); mean for pediatric sleep was 17 min.</li> </ul>
Mindell & Owens 2003(12)	PCP education & training PCP comfort	<ul style="list-style-type: none"> <li>• A minority of nurse practitioners received formal training (28.5%) or post-training CE (17.1%) in sleep</li> <li>• Mean confidence scores for evaluation and treatment varied by sleep disorder, ranging from a high of 3.8 for night wakings and low of 1.6 for narcolepsy</li> </ul>



Study	Topic Area(s)	Notable Finding(s)
Owens 2001(6)	PCP perception of barriers PCP knowledge PCP comfort	<ul style="list-style-type: none"> <li>• Most frequent PCP-identified barrier was that parents would indicate a problem without questioning (21.7% of PCPs)</li> <li>• Mean pediatric sleep knowledge score was 60.3%</li> <li>• Fewer than half reported confidence in ability to screen (46%), evaluate (34.2%) or treat (25.3%) sleep problems</li> </ul>
Owens & Jones 2011(40)	Parental knowledge	<ul style="list-style-type: none"> <li>• Mean score 4.39 correct (out of 10) on a measure of pediatric sleep knowledge</li> <li>• 76% underestimated child's sleep need</li> </ul>
Reich 2005(39)	Parental knowledge	<ul style="list-style-type: none"> <li>• In a survey of maternal knowledge of sleep development, infant sleep patterns was a particularly weak area (mean of 29% correct)</li> </ul>
Rosen et al. 1993(32)	PCP education & training	<ul style="list-style-type: none"> <li>• Mean time spent on sleep in undergraduate medical education was just over 2 hours</li> </ul>
Schnoes et al. 2006(25)	PCP comfort	<ul style="list-style-type: none"> <li>• Majority (69.7%) reported high comfort level treating sleep disturbance</li> </ul>
Stein et al. 2001(17)	Parental help-seeking	<ul style="list-style-type: none"> <li>• Of parents reporting their child had a sleep problem in the past 6 months, only 16% reported discussing with pediatrician</li> </ul>
Tamay et al. 2006(35)	PCP knowledge PCP comfort	<ul style="list-style-type: none"> <li>• Mean score on a measure of OSA knowledge was 66.7%</li> <li>• Mean comfort with pediatric OSA: 3.4 (out of 5) for identification and 2.9 (out of 5) for management</li> </ul>
Uong et al. 2005(36)	PCP knowledge PCP comfort	<ul style="list-style-type: none"> <li>• Mean score for knowledge of pediatric OSA was 69.6% correct</li> <li>• 49.5% comfortable identifying OSA, 29.2% comfortable managing OSA, and 10.9% confident managing children on PAP.</li> </ul>

Abbreviations: CE=continuing education; EDS=excessive daytime sleepiness; OSA=obstructive sleep apnea; PAP=positive airway pressure; PCP=primary care provider; SBD=sleep-disordered breathing

Supplemental Online Table: All studies included in the review.

Study	Participants/Methods	Topic Area(s)
Adachi et al. 2009(31)	<ul style="list-style-type: none"> <li>136 mothers of infants age 4 months in US presenting for a health check-up</li> <li>Intervention group (n=70) received group guidance and educational booklet</li> <li>Outcomes assessed via mailed survey 3 months later</li> </ul>	<ul style="list-style-type: none"> <li>Intervention program</li> </ul>
Adair et al. 1993(30)	<ul style="list-style-type: none"> <li>292 mothers of infants age 4 months in US presenting for a health check-up</li> <li>Intervention group (n=164) received a sleep booklet at 4 month visit and reviewed completed sleep log with PCP at 6 month visit</li> <li>Outcomes assessed via questionnaire completed at 9 month visit</li> </ul>	<ul style="list-style-type: none"> <li>Intervention program</li> </ul>
Archbold et al. 2002(19)	<ul style="list-style-type: none"> <li>Parents of 1038 children (2-13.9 years) in US completed a sleep questionnaire in waiting room prior to appointment with PCP</li> </ul>	<ul style="list-style-type: none"> <li>Prevalence</li> </ul>
Blunden et al. 2003(38)	<ul style="list-style-type: none"> <li>Parents of 626 children (0-16 years) in Australia seeing PCP for sick visit completed a questionnaire about snoring and other symptoms of OSA</li> <li>Parents and PCPs asked if snoring had been discussed at current visit or in the last 12 months</li> </ul>	<ul style="list-style-type: none"> <li>Parental help-seeking</li> </ul>
Blunden et al. 2004(37)	<ul style="list-style-type: none"> <li>Parents of 361 children (4.5-16.5 years) in Australia presenting for a sick visit completed a global sleep questionnaire</li> <li>Parents and PCPs asked if sleep problems had been discussed at current visit or in the last 12 months</li> </ul>	<ul style="list-style-type: none"> <li>Parental help-seeking</li> </ul>
Boreman et al. 2007(14)	<ul style="list-style-type: none"> <li>334 pediatricians board certified in 1995 or 2001 in US responded to a mailed survey about their experience addressing a variety of areas in developmental/behavioral pediatrics</li> </ul>	<ul style="list-style-type: none"> <li>Relevance</li> <li>PCP comfort</li> </ul>
Bruni et al 2004(9)	<ul style="list-style-type: none"> <li>627 pediatricians in Italy in completed a mailed survey on several topics in pediatric sleep, including prevalence, management, and sleep knowledge</li> </ul>	<ul style="list-style-type: none"> <li>Prevalence</li> <li>Relevance</li> <li>Treatment</li> <li>PCP education and training</li> <li>PCP knowledge</li> </ul>
Charles et al. 2011(53)	<ul style="list-style-type: none"> <li>GPs treating children in primary care in Australia documented information about consecutive patient encounters (n=27,399) in 2008-9</li> </ul>	<ul style="list-style-type: none"> <li>Rate of encounter</li> </ul>
Cheng et al. 1999(15)	<ul style="list-style-type: none"> <li>556 pediatricians in US completed a mailed survey on the provision of child health supervision</li> </ul>	<ul style="list-style-type: none"> <li>Relevance</li> <li>PCP comfort</li> </ul>

Chervin et al. 2001(16)	<ul style="list-style-type: none"> <li>• 830 parents of children (2-13.9 years) in US attending appointment with PCP completed sleep questionnaire</li> <li>• Chart notes from the previous two years (n-1395) were reviewed for 86 symptomatic patients</li> </ul>	<ul style="list-style-type: none"> <li>• Prevalence</li> <li>• Documentation of sleep issues</li> <li>• Treatment</li> </ul>
Davis et al. 2012(11)	<ul style="list-style-type: none"> <li>• 70 pediatricians practicing in primary care in US completed an online survey on the provision of behavioral health care</li> </ul>	<ul style="list-style-type: none"> <li>• Rate of encounter</li> <li>• PCP comfort</li> </ul>
Erichsen et al. 2012(23)	<ul style="list-style-type: none"> <li>• Chart review of 1032 children (ages 4-17) in US presenting for WCC to 17 pediatricians</li> <li>• Examined documentation of snoring and follow-up in those who snored</li> </ul>	<ul style="list-style-type: none"> <li>• Documentation of sleep issues</li> <li>• Treatment</li> </ul>
Faruqui et al. 2011(21)	<ul style="list-style-type: none"> <li>• Mailed survey completed by 346 general pediatricians in US on topics including prevalence of sleep, barriers, prior training, knowledge, and comfort</li> </ul>	<ul style="list-style-type: none"> <li>• Screening</li> <li>• PCP perception of barriers</li> <li>• PCP education and training</li> <li>• PCP knowledge</li> <li>• PCP comfort</li> </ul>
Meltzer et al. 2010(20)	<ul style="list-style-type: none"> <li>• Reviewed electronic medical records for 154,957 patients (ages 0-18) seen for well-child visit in 2007</li> <li>• Extracted data on patient demographics, sleep diagnoses, and medications</li> </ul>	<ul style="list-style-type: none"> <li>• Prevalence</li> <li>• Documentation of sleep issues</li> </ul>
Meltzer et al. 2014(5)	<ul style="list-style-type: none"> <li>• Reviewed a randomly selected subsample (n=150) of charts from Meltzer et al. 2010: 50 with ICD-9 sleep disorder, 50 with a sleep problem, and 50 with neither.</li> <li>• Extracted data on patient demographics, other diagnoses, treatment recommendations, medications, and other sleep problems</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment</li> </ul>
Mindell et al 1994(10)	<ul style="list-style-type: none"> <li>• Study 1: Mailed survey completed by 156 pediatric residency programs in US regarding instruction on sleep</li> <li>• Study 2: Mailed survey completed by 88 pediatricians in US examining sleep knowledge</li> <li>• Study 3: Mailed survey completed by 181 pediatricians in US examining sleep beliefs and practices for children ages 6 months to 4 years</li> </ul>	<ul style="list-style-type: none"> <li>• Prevalence</li> <li>• Relevance</li> <li>• Treatment</li> <li>• PCP education and training</li> <li>• PCP knowledge</li> </ul>
Mindell & Owens 2003(12)	<ul style="list-style-type: none"> <li>• 317 pediatric nurse practitioners attending a 2003 meeting completed a survey on demographic information, sleep-related practices, and pediatric sleep educational needs</li> </ul>	<ul style="list-style-type: none"> <li>• Rate of encounter</li> <li>• PCP education and training</li> <li>• PCP comfort</li> </ul>
Mindell et al. 2011(33)	<ul style="list-style-type: none"> <li>• 106 medical school programs in 12 countries (10 in the Asia-Pacific region, US, Canada) responded to a survey about sleep education in six domains</li> </ul>	<ul style="list-style-type: none"> <li>• PCP education and training</li> </ul>
Mindell et al. 2013(34)	<ul style="list-style-type: none"> <li>• Directors of 152 Pediatric residency programs from 10 countries completed a survey on sleep education.</li> </ul>	<ul style="list-style-type: none"> <li>• PCP education and training</li> </ul>

National Sleep Foundation <i>Sleep in America</i> Poll 2004 <sup>20</sup>	<ul style="list-style-type: none"> <li>• Phone survey of random sample of 1,473 caregivers in US with children (age 0-10) living in household</li> </ul>	<ul style="list-style-type: none"> <li>• Screening</li> </ul>
Owens, 2001(6)	<ul style="list-style-type: none"> <li>• 626 general pediatricians in the US completed mailed survey on sleep knowledge, practices, and attitudes</li> </ul>	<ul style="list-style-type: none"> <li>• Prevalence</li> <li>• Screening</li> <li>• Treatment</li> <li>• PCP perception of barriers</li> <li>• PCP knowledge</li> <li>• PCP comfort</li> </ul>
Owens et al. 2003(13)	<ul style="list-style-type: none"> <li>• 671 primary care pediatricians in 6 US cities completed a mailed survey on the use of nonprescription and prescription medications for youth with insomnia symptoms</li> </ul>	<ul style="list-style-type: none"> <li>• Rate of encounter</li> <li>• Treatment</li> </ul>
Owens & Dalzell 2005(24)	<ul style="list-style-type: none"> <li>• BEARS screening tool placed in all charts for all patients (ages 2-12) presenting for WCC as part of a resident continuity clinic over a 5 month period</li> <li>• Compared documentation of sleep in chart notes for 1) visit in which BEARS tool placed in chart and 2) that child's most recent previous WCC, for 195 patients</li> </ul>	<ul style="list-style-type: none"> <li>• Screening intervention</li> </ul>
Owen & Jones 2011(40)	<ul style="list-style-type: none"> <li>• 184 sleep knowledge surveys were collected from 184 parents of children aged 3 months to 12 years attending a primary care appointment</li> </ul>	<ul style="list-style-type: none"> <li>• Parental knowledge</li> </ul>
Reich, 2005(39)	<ul style="list-style-type: none"> <li>• 106 low-income mothers of youth attending a pediatric primary care visit completed a questionnaire assessing knowledge of child development</li> </ul>	<ul style="list-style-type: none"> <li>• Parental knowledge</li> </ul>
Rosen et al. 1993(32)	<ul style="list-style-type: none"> <li>• 545 instructors from 126 US medical school programs completed a survey assessing preclinical and clinical training in sleep</li> </ul>	<ul style="list-style-type: none"> <li>• PCP education and training</li> </ul>
Schnoes et al. 2006(25)	<ul style="list-style-type: none"> <li>• 222 pediatricians in 4 US states completed a survey on treatment practices for sleep disturbance, focusing on prescribing practices for Clonidine</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment</li> <li>• PCP comfort</li> </ul>
Stein et al. 2001(17)	<ul style="list-style-type: none"> <li>• Parents of 472 children (ages 4-12 years) attending a primary care appointment in the US completed surveys on their child's sleep and behavior</li> </ul>	<ul style="list-style-type: none"> <li>• Prevalence</li> <li>• Parental help-seeking</li> </ul>
Tamay et al. 2006(35)	<ul style="list-style-type: none"> <li>• 138 pediatricians in Turkey completed a survey assessing physician knowledge and attitudes about childhood OSA and its treatment</li> </ul>	<ul style="list-style-type: none"> <li>• PCP knowledge</li> <li>• PCP comfort</li> </ul>
Uong et al. 2005(36)	<ul style="list-style-type: none"> <li>• 497 primary care physicians in 3 US cities completed a survey assessing physician knowledge and attitudes about childhood OSA and its treatment</li> </ul>	<ul style="list-style-type: none"> <li>• PCP knowledge</li> <li>• PCP comfort</li> </ul>

Abbreviations: GP=general practitioner; PCP=primary care provider; US=United States; WCC = well child check-up